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1.1 Mathematical Modeling of Robots 3

1.1.1 Symbolic Representation of Robots

3 1.1.2 The Con?guration Space 4 1.1.3 The State Space 5 1.1.4 The Workspace 5 1.2 Robots as Mechanical Devices 5 ... degree of autonomy, usually under computer control, has at some point been called a robot. In this text the term robot will mean a computer controlled

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distinct parts; the first two serve as a guide to the fundamentals of robotics and motion control, while the last two dive more in-depth into control theory and nonlinear system analysis. With the new edition, readers gain access to new case studies and thoroughly researched information covering topics such as: ? Motion-

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life situations A four-part reference essential for both undergraduate and graduate students, Robot Modeling and Control serves as a foundation for a solid education in robotics and motion planning.

This self-contained introduction to practical robot kinematics and dynamics

includes a comprehensive treatment of robot control. It provides background material on terminology and linear transformations, followed by coverage of kinematics and inverse kinematics, dynamics, manipulator control, robust control, force control, use of feedback in nonlinear systems, and adaptive control.

Each topic is supported by examples of specific applications. Derivations and proofs are included in many cases. The book includes many worked examples, examples illustrating all aspects of the theory, and problems.

Written by two of Europe's leading

robotics experts, this book provides the tools for a unified approach to the modelling of robotic manipulators, whatever their mechanical structure. No other publication covers the three fundamental issues of robotics: modelling, identification and control. It covers the development of various mathematical

models required for the control and simulation of robots. · World class authority · Unique range of coverage not available in any other book · Provides a complete course on robotic control at an undergraduate and graduate level

Based on the successful Modelling and

Control of Robot Manipulators by Sciavicco and Siciliano (Springer, 2000), Robotics provides the basic know-how on the foundations of robotics: modelling, planning and control. It has been expanded to include coverage of mobile robots, visual control and motion planning. A variety of problems is raised throughout,

and the proper tools to find engineering-oriented solutions are introduced and explained. The text includes coverage of fundamental topics like kinematics, and trajectory planning and related technological aspects including actuators and sensors. To impart practical skill, examples and case studies are carefully

worked out and interwoven through the text, with frequent resort to simulation. In addition, end-of-chapter exercises are proposed, and the book is accompanied by an electronic solutions manual containing the MATLAB® code for computer problems; this is available free of charge to those adopting this volume as a

textbook for courses.

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Control, students will cover the theoretical fundamentals and the latest technological advances in robot kinematics. With so much advancement in technology, from robotics to motion planning, society can implement more powerful and dynamic algorithms than ever before. This in-depth reference guide educates readers in four

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life situations A four-part reference essential for both undergraduate and graduate students, Robot Modeling and Control serves as a foundation for a solid education in robotics and motion planning.

Humanoid Robots: Modeling and Control provides systematic presentation of the

models used in the analysis, design and control of humanoid robots. The book starts with a historical overview of the field, a summary of the current state of the art achievements and an outline of the related fields of research. It moves on to explain the theoretical foundations in terms of kinematic, kineto-static and

dynamic relations. Further on, a detailed overview of biped balance control approaches is presented. Models and control algorithms for cooperative object manipulation with a multi-finger hand, a dual-arm and a multi-robot system are also discussed. One of the chapters is devoted to selected topics from the area of motion

generation and control and their applications. The final chapter focuses on simulation environments, specifically on the step-by-step design of a simulator using the Matlab® environment and tools. This book will benefit readers with an advanced level of understanding of robotics, mechanics and control such as

graduate students, academic and industrial researchers and professional engineers. Researchers in the related fields of multi-legged robots, biomechanics, physical therapy and physics-based computer animation of articulated figures can also benefit from the models and computational algorithms presented in the

book. Provides a firm theoretical basis for modelling and control algorithm design Gives a systematic presentation of models and control algorithms Contains numerous implementation examples demonstrated with 43 video clips

The author has maintained two open-

source MATLAB Toolboxes for more than 10 years: one for robotics and one for vision. The key strength of the Toolboxes provide a set of tools that allow the user to work with real problems, not trivial examples. For the student the book makes the algorithms accessible, the Toolbox code can be read to gain understanding,

and the examples illustrate how it can be used —instant gratification in just a couple of lines of MATLAB code. The code can also be the starting point for new work, for researchers or students, by writing programs based on Toolbox functions, or modifying the Toolbox code itself. The purpose of this book is to expand on the

tutorial material provided with the toolboxes, add many more examples, and to weave this into a narrative that covers robotics and computer vision separately and together. The author shows how complex problems can be decomposed and solved using just a few simple lines of code, and hopefully to inspire up and

coming researchers. The topics covered are guided by the real problems observed over many years as a practitioner of both robotics and computer vision. It is written in a light but informative style, it is easy to read and absorb, and includes a lot of Matlab examples and figures. The book is a real walk through the fundamentals of

robot kinematics, dynamics and joint level control, then camera models, image processing, feature extraction and epipolar geometry, and bring it all together in a visual servo system. Additional material is provided at http://www.petercorke.com/RVC

This book provides detailed fundamental theoretical reviews and preparations necessary for developing advanced dynamics modeling and control strategies for various types of robotic systems. This research book specifically addresses and discusses the uniqueness issue of representing orientation or rotation, and

further proposes an innovative isometric embedding approach. The novel approach can not only reduce the dynamic formulation for robotic systems into a compact form, but it also offers a new way to realize the orientational trajectory-tracking control procedures. In addition, the book gives a comprehensive

introduction to fundamentals of mathematics and physics that are required for modeling robot dynamics and developing effective control algorithms. Many computer simulations and realistic 3D animations to verify the new theories and algorithms are included in the book as well. It also presents and discusses the

principle of duality involved in robot kinematics, statics, and dynamics. The duality principle can guide the dynamics modeling and analysis into a right direction for a variety of robotic systems in different types from open serial-chain to closed parallel-chain mechanisms. It intends to serve as a diversified research

reference to a wide range of audience, including undergraduate juniors and seniors, graduate students, researchers, and engineers interested in the areas of robotics, control and applications.

A modern and unified treatment of the mechanics, planning, and control of

robots, suitable for a first course in robotics.